SIEMENS

Background information

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The Industrial Metaverse at Siemens Digital Industries

What is the "Industrial Metaverse"?

The metaverse is often thought of as the next generation of the Internet: an immersive digital world where people can interact with each other or with machines in real time. The Industrial Metaverse will be a digital space where individuals and companies can work and interact with digital twins of machines, products, factories, buildings, cities, networks, and transportation systems. In this realistic digital environment, people can:

- Experience a digital twin directly and get new insights
- Meet digitally in real time to work together on a digital twin
- Continuously simulate, evaluate, and make predictions about different scenarios
- Monitor, analyze, and control the real-world assets and machines connected to a digital twin

The Industrial Metaverse is in the early stages of development. It’s created by the interaction of technologies like the digital twin, AI, IoT, blockchain, and edge and cloud computing. Interoperability, connectivity, and employee qualifications are extremely important for integrating these technologies and building a digital world where everyone works together as seamlessly as in the real world.

Siemens and the Industrial Metaverse

The Industrial Metaverse is an ongoing development of what Siemens has already been doing: connecting the real and digital worlds. Siemens has the hardware and software, the unique expertise, and a strong ecosystem:

- Technologies: Siemens already offers many of the fundamental technologies for the Industrial Metaverse, including IoT, AI, 5G, blockchain, edge computing, cybersecurity – and most importantly, physics-based digital twins.

- Expertise: The experts at Siemens have a deep understanding of how the real world of buildings, energy grids, manufacturing processes, and transportation systems works.
- Ecosystem: Siemens is working closely with other companies that offer complementary technologies for building the Industrial Metaverse. In partnership with Nvidia, Siemens is collaborating on next-generation digital twins that take industrial automation to a new level.

At the heart of the Industrial Metaverse is an intuitive, interactive, holistic environment where the real and virtual worlds merge, allowing users to visually interact and experience everything throughout the product or production lifecycle. The Industrial Metaverse is a space where individuals can make real technical decisions based on the high level of detail in the information that surrounds them. Users also have an opportunity to interact with each other in the Industrial Metaverse and harness the power of comprehensive digital twin models across the entire product, production, and service lifecycle. Through a constant exchange of information, data, and decisions, the Industrial Metaverse enables complex industrial problems to be solved digitally, regardless of location – and this changes the way companies work and unleashes significant sustainable, and resilient benefits for society.

Use Cases: Electronics Factory, Erlangen

The Siemens Electronics Factory in Erlangen, the leading electronics plant for Siemens Motion Control, manufactures electronic components like CNC controls and power electronics products. The products are very diverse and are manufactured in a highly automated production facility. The Industrial Metaverse helps experts study their manufacturing and all associated machines based on operational data and triggered events. Siemens is working with a number of use cases in Erlangen:

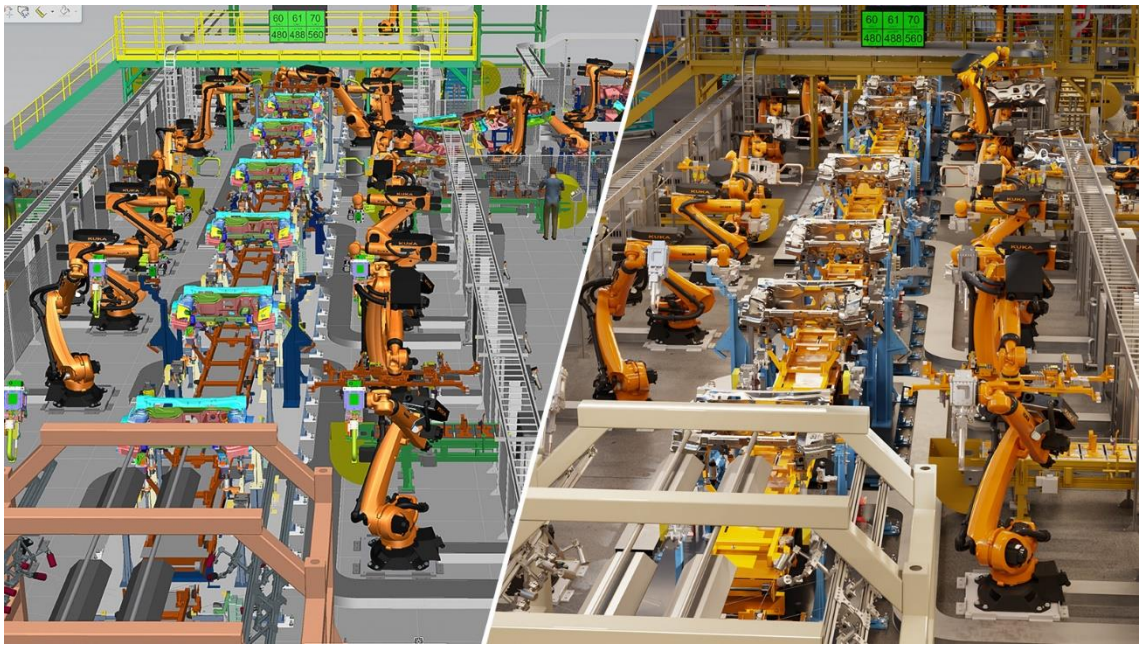
1. Collaborative layout planning

In the factory, a so-called collaborative layout is used. This is a comprehensive digital twin used for the visual planning of layout and production. This layout can be used to efficiently plan the introduction of new machines and new products or the relocation of production lines so that they’re correct in the real world the first time. This saves time and money and is a more sustainable process.

2. AI training with synthetic data
At the Electronics Factory in Erlangen, AI is trained with synthetically generated data. The combination of AI algorithms and high-quality visual renderings can be used to generate training data: for example, for real robotics applications in the plant. As a result, the plant achieves a rapid ramp-up of automation and accelerates productivity increases.

3. Coping with production problems
As production systems and lines become increasingly complex, operational problems can be solved collaboratively in the Industrial Metaverse. Today production facilities no longer have all their expertise on-site. The Electronics Factory in Erlangen created a collaborative platform where different experts can work together and where all the data they need is easily accessible so they can verify or falsify hypotheses.

Looking to the future
With the Industrial Metaverse, Siemens is striving for a new level of intelligent analysis of operational data. The technology company's experience and expertise in the integration and simulation of products, services, and solutions at the interface of IT and OT can lead to new insights in the Industrial Metaverse, enable new efficiency gains, and generate new business models. The underlying premise is the digital transformation of industry. Siemens Xcelerator, the open digital business platform, creates a powerful ecosystem of partners that are working together to accelerate the digital transformation so that it can be tailored to customers' specific business goals. Siemens Xcelerator consists of a selected portfolio of products, services, and solutions as well as a marketplace. The portfolio is open and flexible and ensures the interoperability that’ critical to the development and use of the Industrial Metaverse.



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Contact for journalists

Katharina Rebbereh

Tel.: +49 172 841 35 39

E-Mail: katharina.rebbereh@siemens.com

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Siemens Digital Industries (DI) is an innovation leader in automation and digitalization. Closely collaborating with partners and customers, DI drives the digital transformation in the process and discrete industries. With its Digital Enterprise portfolio, DI provides companies of all sizes with an end-to-end set of products, solutions and services to integrate and digitalize the entire value chain. Optimized for the specific needs of each industry, DI's unique portfolio supports customers to achieve greater productivity and flexibility. DI is constantly adding innovations to its portfolio to integrate cutting-edge future technologies. Siemens Digital Industries has its global headquarters in Nuremberg, Germany, and has around 72,000 employees internationally.

Siemens AG (Berlin and Munich) is a technology company focused on industry, infrastructure, transport, and healthcare. From more resource-efficient factories, resilient supply chains, and smarter buildings and grids, to cleaner

and more comfortable transportation as well as advanced healthcare, the company creates technology with purpose adding real value for customers. By combining the real and the digital worlds, Siemens empowers its customers to transform their industries and markets, helping them to transform the everyday for billions of people. Siemens also owns a majority stake in the publicly listed company Siemens Healthineers, a globally leading medical technology provider shaping the future of healthcare. In addition, Siemens holds a minority stake in Siemens Energy, a global leader in the transmission and generation of electrical power.
In fiscal 2022, which ended on September 30, 2022, the Siemens Group generated revenue of €72.0 billion and net income of €4.4 billion. As of September 30, 2022, the company employed around 311,000 people worldwide. Further information is available on the Internet at www.siemens.com.